Harold St. John.

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THE NEW ENGLAND BOTANICAL CLUB

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THE MARITIME PLANTAINS OF NORTH AMERICA.

M. L. Fernald.

(Plate 150.)

For several years it has been apparent to some students of the flora of eastern America that the plants which pass with some botanists as *Plantago maritima* L., with others as *P. decipiens* Barnéoud, are really two distinct species and that they certainly are not identical with *P. maritima* of Europe. The latter species, which does not occur in eastern America, is a characteristic plant with the scapes commonly much longer than the leaves; the bracts of the spike narrowly ovate (sometimes described even as lanceolate), much longer than broad; the calyx-segments narrowly ovate to narrowly oblong and with conspicuously ciliate-denticulate keels; and the mature capsules slender and acute. Whether true *P. maritima* occurs in America is not wholly clear. In the Gray Herbarium there is a specimen typical in every detail marked Sitka (coll. *Bongard*) but all other Alaskan material seen is the Pacific American *P. juncoides* Lam. The common American plants which have passed, off and on, for *P. maritima* have less contrast in the length of leaf and scape; the bracts broadly ovate to subreniform, as broad as long; the calyx-segments broadly oblong to suborbicular, and not definitely ciliate on the keel; the mature capsules ovoid to broadly conic-ovoid and rounded at summit. In the plants of Atlantic America the anthers are well under 2 mm. in length, but on the Pacific coast they may reach a maximum of 2 mm. In such European material as is at hand (too little for generalization) the anthers are 2–2.3 mm. long.

As stated, in eastern America two well defined species of Seaside Plantain occur. One (fig. 6), a plant of salt-marsh and saline shores,

has succulent linear to linear-lanceolate leaves, usually equaling or, in the northern extreme, much exceeding the scapes; and it is commonly gathered in eastern Maine and the Maritime Provinces as a delicious vegetable under the name "Goose Tongue." Its spikes are usually blackish in general color, in all but dwarfed individuals 0.6–2 dm. long (in small plants down to less than 1 cm. long), rather loosely flowered especially at base; the bracts (fig. 6^a) subtending the flowers are often, but not always, prolonged at tip and then exceed the calyces, being very fleshy and glabrous, with thick or gibbous keels; the calyx (fig. 6^a) is glabrous; and the linear-oblong mostly black seeds (fig. 6^b) are 2–3 mm. long. There is no question, judging by its scape commonly shorter than the leaves, interrupted spike, acute glabrous bracts and its range that, when he described *Plantago pauciflora*, Pursh[1] had small specimens of the "Goose Tongue" of salt marshes from Labrador to New Jersey. Pursh's description was to the point:

P. foliis lineari-lanceolatis integerrimis glabriusculis, scapo tereti foliis breviore, spica pauciflora interrupta, bracteis ovatis acutis glabris. *pauciflora*
On the sea-coast of New England and New Jersey. . . . Aug. *v. v.* In the Herbarium of A. B. Lambert, Esq. are specimens from Labrador, agreeing in every respect with this species.

Pursh's specific name was highly inappropriate, because only exceptionally dwarfed plants (fig. 7), occurring chiefly north of New England, have spikes notably few-flowered, and ordinarily on the coast of New England and New Jersey his *P. pauciflora* has spikes (fig. 6) longer than in any other of the maritime Plantains of America or Eurasia; but since there were already two other species bearing the name *P. pauciflora*, one of Gilibert (1782), the other of Lamarck (1783), the first perhaps not identifiable, the second identical with *P. barbata* Forst. (1789), Roemer & Schultes renamed Pursh's species, literally quoting his description and perpetuating the misleading connotation of his name by changing it merely to *P. oliganthos*.[2] During the same year Rafinesque made a gesture at publishing an appropriate name, saying in a review of Bigelow's *Florula Bostoniensis*: "*Plantago maritima*, Big. is perhaps *Pl. gibbosa*, Raf. n. sp."[3] Bigelow,[4] however, had given absolutely no diagnostic character to dis-

[1] Pursh. Fl. Am. Sept. i. 99 (1814).
[2] R. & S. Syst. iii. 122 (1818).
[3] Raf. Am. Mo. Mag. ii. 344 (1818).
[4] Bigel. Fl. Bost. 34 (1814).

tinguish his plant from others of the group and, supposing it to be *P. maritima* of Europe, had literally translated into English the Latin description in Smith's *Flora Britannica*, clearly acknowledging his source. *P. gibbosa*, a name which would be appropriate for the salt-marsh plant of eastern America but published only half-heartedly by Rafinesque and without a description, cannot be taken up and the salt-marsh plant with long and rather loose spikes and glabrous bracts and calyx must be called *P. oliganthos* R. & S.

The other species of eastern America (fig. 3) grows on headlands, cliffs and dry beaches and even ascends to alpine rocks, commonly near the coast but apparently never in salt-marsh. Its range is essentially the same as that of *P. oliganthos* but northward, where headlands preponderate over salt-marshes, it is common; southward where headlands become infrequent, it is local. This headland plant is distinguished from *P. oliganthos* by its usually narrower and decidedly less fleshy leaves commonly shorter than the scape, its dense and comparatively short spikes (the longer ones 2–10 cm. long) usually brown or drab in color; its bracts and calyx-segments minutely ciliolate (fig. 3^a), the former less fleshy and not so definitely keeled nor so prolonged as in *P. oliganthos;* the oblong to narrowly oval often brown seeds (fig. 3^b) shorter (1.2–2.3 mm. long) and the anthers averaging slightly shorter. This plant was described with remarkable precision by Barnéoud:[1]

PLANTAGO DECIPIENS. (Barnéoud.)
Diagn.—Pubescens. Foliis *linearibus*, acutis; spica *brevis;* bracteae *ciliolatae;* corollae *minutae*, acutae. *Stamina vix exserta.*
Descript.—5–6 poll. Collo radicis crassiusculo. Folia puberula, 3-nervia, integerrima, plana, basi lanata, scapo breviora. Scapus pubescens, teres. Spica 1-poll. bracteae acutae laetae, calycem aequantes. Calycis segmenta obtusa, ciliolata. Corollae tubus brevis, laciniae parvae. Stamina stigmate breviora. Capsula depressa 2-loc. 4-sperma.—(V. S. mss. Cl. Hooker in herb. Cl. Decais.)
Hab.—In provincia *Labrador.*—(Morrison.)
OBS. Cette espèce ressemble, au premier aspect, au *Pl. maritima*, dont elle a le port.—Cela justifie le nom de *decipiens.*

In the northern half of its range *P. decipiens* becomes very dwarfed, with scapes only 1–7 cm. long and spikes 0.5–2 cm. long. This is the plant (fig. 4) of Greenland, Iceland and arctic Europe described and beautifully illustrated by Lange as *P. borealis*, Lange[2] pointing out that it is related to both *P. alpina* L. and *P. maritima* L. of

[1] Barnéoud, Mon. Plantaginées, 16 (1845).
[2] Lange, Fl. Dan. xvi. fasc. xlvi. 5, t. mmdccvii (1867).

Europe; the former differing in its denticulate, scarcely fleshy, acute and broader leaves, its villous calyx, more ovate and obtuse corolla-lobes, and wingless seeds; the latter in its more slender and relatively shorter leaves, 2-seeded (instead of 4-seeded) capsules, linear (instead of oval) seeds, etc. As Lange further points out, the same plant (from Greenland and Iceland) had earlier been published as *P. maritima*, var. *glauca* Hornem.[1] and by Decaisne and others had been confused with *P. alpina*.

P. decipiens and its dwarf northern extreme, *P. borealis* Lange, have slender semi-terete linear erect leaves usually shorter than the scapes; but on cliffs, headlands and dry sands of Newfoundland, the Magdalen Islands, Prince Edward Island and Nova Scotia, there is a plant (fig. 5) with lanceolate or broadly linear comparatively thin spreading or rosulate often dentate leaves which usually equal or exceed the arching scapes. In aspect the plant strongly simulates the broader-leaved forms of the European *P. alpina*, though with relatively long leaves; but in the technical characters of bracts, calyx, anther and seed it departs from that species and belongs with *P. decipiens* and *P. borealis* into which it certainly intergrades.

On the Pacific coast of North America occur, besides the doubtful *P. maritima* (already discussed) two well marked plants. One (fig. 1), following the coast from southern Alaska to Alameda Co., California, has the but slightly fleshy linear or linear-lanceolate erect leaves attenuate at tip and approaching to equaling the length of the erect scapes; the other (fig. 2), confined to the coast from Sonoma Co., to Monterey Co., California, has the linear-oblanceolate to subspatulate spreading or rosulate leaves very fleshy and mostly shorter than the depressed or arching scapes. The only other difference apparent, after prolonged study, is that the more generally distributed plant with erect, long and attenuate leaves has the seeds very slightly longer than in the other. In all their technical characters of short and dense spike and in bract, calyx and seed the two plants of the Pacific coast are apparently inseparable from *P. decipiens* and *P. borealis* of the Atlantic coast; the only character of significance being a slight difference in the anther: the anthers of the plants of the Atlantic coast are 1–1.5 mm. long with subulate tips 0.1–0.4 mm. long; those of the Pacific coast slightly longer (1.5–2 mm. long, the subulate tips 0.3–0.7 mm.). The plants of both the Atlantic and the Pacific

[1] Hornem. Oec. Pl. ed. 3, i. 167 (1821).

coasts with dense spikes, ciliolate calyx-segments and comparatively small seeds (1.2–2.3 mm. long) seem, then, to be variations of one widely distributed species and it at once becomes significant that in no character which I can discover do the specimens at hand of the Patagonian *P. juncoides* Lam.[1] differ from the plant which grows from California to Alaska. They have similar elongate and attenuate leaves, and the large anthers and the comparatively large seed of that plant; and since the name *P. juncoides* is older by many years than *P. decipiens* it is evident that this wide-ranging but variable species of arctic Europe, Greenland, Atlantic North America, Pacific North America and Patagonia must take the name *P. juncoides* Lam. Although the range of this species is unusual it is by no means without parallels: such cases as *Triglochin maritima* L. and *T. palustris* L., *Catabrosa aquatica* (L.) Beauv., *Carex capitata* L., *C. incurva* Lightf., *C. microglochin* Wahlenb. *C. Macloviana* D'Urv. and *Montia lamprosperma* Cham.

For many years Asa Gray recognized that there were two representatives of *Plantago maritima* in America but he failed to detect their most important characters and his treatments are, therefore, not easy to interpret; and throughout the time from his first attempt at differentiation in 1856 to his treatment in the *Synoptical Flora* he considered first one then the other of our species to be typical *P. maritima* of Europe. In the 2d edition of the *Manual* he recognized as *P. maritima* the plant of "Salt marshes on the coast from New Jersey northward," with "very fleshy leaves," and "sepals, which have a thick keel," *i. e. P. oliganthos;* and as *P. maritima,* var. *juncoides* a plant said to be "more slender, the flowers often sparser, and the keels crestless," and occurring "only northward." The distinctions do not exactly coincide with the characters best separating our two species, and in the 5th edition Gray slightly altered the treatment, depending chiefly upon the wholly unsatisfactory characters of duration: *P. maritima,* var. *juncoides* (*P. juncoides* Lam.) being considered an annual or biennial of salt-marshes southward, while "the perennial P. maritima occurs in New Brunswick, &c., perhaps in Maine;" but, in the *Synoptical Flora,* Gray abandoned the name *juncoides,* reducing it outright to *P. maritima* of Europe, which he now treated as a perennial with spike dense and bracts rounded and short, and known to him on the Atlantic coast only

[1] Lam. Tabl. Encyl. Meth. Bot. i. 342 (1783).

north of the Gulf of St. Lawrence but on the Pacific coast from California to Bering Straits and in Patagonia; *i. e.* Gray's *P. maritima* of his latest treatment was true *P. juncoides* Lam., including the plants which I have identified with *P. decipiens* Barnéoud and *P. borealis* Lange. But still failing to detect the fundamental characters which Pursh had clearly pointed out in describing his *P. pauciflora* (*P. oliganthos*) and which Barnéoud has emphasized for *P. decipiens* and still laying undue emphasis upon the duration of the plants, Gray put all *annual* specimens under *P. decipiens* and for it drew up a good description of the salt marsh *P. oliganthos*, with "spike slender, . . . lower bracts commonly ovate-subulate and equaling or exceeding the calyx." Watson & Coulter adopted, in the 6th edition of the *Manual*, Gray's last treatment with only slight change, but Watson had been collecting on the New England coast and under the "*annual*" plant said: "The characters distinguishing biennial specimens of this form from the next are obscure"; and, knowing from field experience that these plants often begin fruiting the first year, but that they apparently continue growing through several seasons, the editors of the 7th edition of the *Manual* treated them as one variable species, *P. decipiens*. Britton, on the other hand, has consistently treated all the American material as identical with the European *P. maritima*.

That the three species, *P. maritima* L., *P. juncoides* Lam. (including *P. decipiens* Barnéoud and *P. borealis* Lange) and *P. oliganthos* R. & S. are quite distinct has been sufficiently pointed out in this discussion. The characters, bibliography and ranges of the three are summarized below. The material in the Gray Herbarium and the herbarium of the New England Botanical Club has been adequately supplemented by specimens from the Academy of Natural Sciences of Philadelphia, for the use of which I am indebted to Mr. Bayard Long, and material from the University of California most kindly loaned by Professor Setchell. The illustrations have been drawn by Miss Amelia Brackett.

a. Bracts subtending the middle and upper flowers of the spike narrowly ovate to lanceolate, distinctly longer than broad; calyx-segments narrowly ovate to narrowly oblong, ciliate and with thin ciliate-denticulate keel: mature capsules slenderly oblong-conic, acute, 1.2–2 mm. in diameter: anthers 2–2.3 mm. long: scapes much exceeding the leaves ..... *P. maritima.*

a. Bracts subtending the middle and upper flowers broadly ovate, subreniform or suborbicular, as broad as or broader

than long: calyx-segments broadly oblong to suborbicular, not definitely ciliate on the thick or obscure keel: mature capsules ovoid to broadly conic, blunt or rounded at summit, 1.2–2.6 mm. in diameter: anthers 1–2 mm. long: scapes shorter than to slightly exceeding the leaves *b*.

b. Bracts or calyx-segments or both minutely ciliolate; the bracts rarely prolonged and with only slight keel: mature seeds oblong to narrowly oval, 1.2–2.3 mm. long: spikes usually dense to the base, the longest rarely 0.6–1 dm. long: scapes often somewhat exceeding the fleshy to thinnish leaves ..... *P. juncoides.*

b. Bracts and calyx-segments glabrous or very rarely with remote ciliation; the former often with prolonged tips and with thick or gibbous keel: mature seeds linear-oblong, 2–3 mm. long: spikes often remotely flowered at base, in large plants becoming 0.6–2 dm long; leaves often equaling or exceeding the scapes, very fleshy ... *P. oliganthos.*

P. MARITIMA L. Sp. Pl. 114 (1753); for synonymy see Rouy, Fl. de France, x. 123 (1908).—Europe. The only evidence of its occurrence in America is material said to be from ALASKA: Sitka, *Bongard*. Needs validation.

P. JUNCOIDES Lam. Tabl. Encyl. Meth. Bot. i. 342 (1783). A wide-ranging species divisible into five geographic varieties:

a. Anthers 1.5–2 mm. long; their subulate tips 0.3–0.7 mm. long: Pacific American and Patagonian *b*.

b. Leaves linear to linear-lanceolate, attenuate at tip, only slightly fleshy and with the scapes strongly ascending: seeds 1.6–2.3 (av. 2) mm. long ..... Var. *typica.*

b. Leaves linear-oblanceolate to subspatulate, obtuse, very fleshy, depressed or spreading: scapes depressed or arching: seeds 1.3–1.7 (av. 1.5) mm. long ..... Var. *californica.*

a. Anthers 1–1.5 mm. long; their subulate tips 0.1–0.4 mm. long: Atlantic American and arctic European *c*.

c. Leaves linear, erect or strongly ascending, only rarely spreading, entire, commonly shorter than the scapes. Scapes 0.5–2.3 dm. high: longer spikes 2–10 cm. long .. Var. *decipiens.*
Scapes 1–7 cm. high; spikes 0.5–2 cm. long ..... Var. *glauca.*

c. Leaves lanceolate to oblanceolate, depressed or wide-spreading, often toothed, commonly equaling or exceeding the scapes ..... Var. *laurentiana.*

Var. **typica**, Fig. 1. *P. juncoides* Lam. l. c. (1783). *P. maritima*, var. *juncoides* (Lam.) Gray, Man. ed. 2: 268 (1856), as to name-bringing synonym, not as to plant. *P. maritima* in part of many Am. Auth., not L.—Southern Alaska to Alameda Co., California; Patagonia. The following are referred here. ALASKA: Coal Harbor, Unga Island, July 15, 1872, *M. W. Harrington;* sea-shore, Popoff Island, Shumagin Islands, June 28, 1872, *Harrington;* upper portion of sandy tidal flat, mainland, Port Houghton, *Walker*, no. 863; beach, Skagway, *Eastwood*, no. 729; Sitka, 1867, *Tiling*. BRITISH COLUMBIA: Brown's Island, San Juan Islands, *Zeller*, no. 759; Vancouver Island, 1858, *Lyall;* on slate, District of Renfrew, Vancouver Island, *Rosendahl & Brand*, no. 21. WASHINGTON: Orchard Point, Kitsop

Co., July, 1895, *Piper*. OREGON: damp cliffs, Yaguina Head, *J. C. Nelson*, no. 2342. CALIFORNIA: sandy ground on bay shore, Bucksport, Humboldt Bay, *Tracy*, no. 3254; on tide ground, Corte Madera, *Bigelow;* on rocks, Martinez, *Brewer*, no. 997; near Martinez, *Burtt Davy*, no. 6670; Alameda Co., 1887, *A. B. Simonds;* salt-marshes, West Berkeley, *Burtt Davy*, no. 860; Alameda, October 3, 1898, *Setchell*. PATAGONIA: Rio Negro, 1838–42, *U. S. So. Pacific Expl. Exped.*

Var. **californica**, n. var. (FIG. 2), foliis carneis lineari-oblanceolatis vel subspathulatis obtusis depressis vel rosulatis; scapis depressis vel arcuatis; seminibus 1.3–1.7 mm. longis.—Sonoma Co. to Monterey Co., CALIFORNIA: Bodega Point, *Eastwood*, no. 4878; Point Reyes, *Burtt Davy*, no. 6794; Tennessee Cove, *Suksdorf*, no. 467; Fort Point, April, 1887, *E. L. Drew;* near San Francisco, 1865, *Torrey*, no. 418; Montara Point, June 5, 1903, *E. B. Copeland*, no. 3331 (TYPE in Gray Herb.); Santa Cruz, April 15, 1897, *Setchell;* Pacific Grove, June, 1893, *Tidestrom*, July 8, 1914, *Gwendolen Newell;* along the beach, Point Pinos, *Heller*, no. 6755; Pescadero Ranch, near Monterey, *Brewer*, no. 647; Cypress Point, Monterey, *Eastwood*, no. 102.

In the herbarium of the Academy of Natural Sciences of Philadelphia there is a plant somewhat intermediate between typical *P. juncoides* and var. *californica* but rather nearer the latter (but with erect leaves) with the label: Salt Lake, Utah, *T. Meehan*, 1883. Further evidence of its occurrence in Utah is desirable.

Var. **decipiens** (Barnéoud), n. comb. FIG. 3. *P. decipiens* Barnéoud, Mon. Plantag. 16 (1845). *P. maritima*, in part, of Am. authors, not L.—Headlands, cliffs and dry beaches, chiefly or entirely above salt water, southern Labrador to New Jersey.—The following, from more than 100 numbers examined, may be cited as characteristic. NEWFOUNDLAND: grassy cliffs above the harbor, St. John's, August, 1885, *R. Thaxter*; ledges of damp sea-cliffs, Torbay, *Howe & Lang*, no. 1376; gravelly and rocky sea-shore, Snook's Arm, *Fernald & Wiegand*, no. 6217; on rocks, Birchy Cove (Curling), *Fernald & Wiegand*, no. 4021. QUEBEC: Seven Islands, *C. B. Robinson*, no. 675; Cap Baleine, Anticosti, *Victorin*, no. 4207; sea-cliffs, Bonaventure Island, *Fernald & Collins*, no. 1177; dry limestone detritus, Cap Barré, Percé, August 16, 1904, *Collins, Fernald & Pease;* calcareous headlands by the River St. Lawrence, Grosses Roches, *Fernald & Pease*, no. 25,283; ledges by the St. Lawrence, Rivière Blanche, August 3, 1904, *F. F. Forbes;* rocky shores of the St. Lawrence, Temiscouata Co., July 26, 1878, *Pringle;* shaly headland by the River St. Lawrence, Berthier, *Fernald & Pease*, no. 25,282. MAGDALEN ISLANDS: sandy bluffs, Grindstone, *Fernald, Long & St. John*, no. 8045; dry sandy summit of Great Bird Rock, *St. John*, no. 1987. PRINCE EDWARD ISLAND: marshes near Tracadie Beach, July 29, 1901, *Churchill.*

Nova Scotia: Point Prim, August 19, 1902, *M. A. Day;* turfy crest of headland, Markland, *Fernald & Long*, no. 24,511; gravelly sea-beach, Yarmouth Bar, *Fernald & Long*, no. 24,512. New Brunswick: Restigouche, 1873, *Fowler;* dry gravel-pavement back of beach, Belledune Point, *Fernald & Pease*, no. 25,285; beach of Bay Chaleur, Grand Anse, *Blake*, no. 5532; sterile field on top of cliffs, Casey's Cape, Kent Co., July 9, 1914, *F. T. Hubbard.* Maine: crevices of rocks by the sea, Cutler, July 13, 1901, *Kennedy;* dry ledges, Roque Bluffs, July 5, 1907, *Knowlton;* shore of pool, Great Cranberry Isle, August 30, 1892, *Rand;* rocky shores of Baker's Island, July 23, 1890, *Redfield;* rocky shore, Moore's Harbor, Isle au Haut, *Hill*, no. 1178; rocky shores and banks, Matinicus, July 20, 1919, *C. A. E. Long;* clefts of rocks, Round Pond, August 26, 1897, *Chamberlain;* among rocks, Georgetown, August 12, 1900, *H. M. Noyes;* crevices of rock above high tide level, Bowdoinham, *Fassett*, no. 210; crevices of ledges Orr's Island, *Chamberlain & Knowlton*, no. 577; on rocks, Scarboro, July 16, 1861, *Wm. Boott;* very dry soil and rock-crevices, Ogunquit, July 15, 1903, *Parlin.* New Hampshire: Appledore, Isles of Shoals, July 10, 1898, *C. H. Morss.* Massachusetts: Marblehead Neck, August, 1888, *E. H. Hitchings;* Beverly Bay, *Asa Gray;* rocks near shore, Nahant, September 6, 1857, *E. S. Hoar;* Nantasket Beach, July 18, 1884, *T. O. Fuller;* sea-shore sands, Cohasset, August 6, 1907, *Driggs.* Rhode Island: rocks and fields, Newport, July 24, 1896, *M. B. Simmons;* rocks, Jamestown, June 26, 1897, *M. B. Simmons;* Narragansett Pier, July 28, 1891, *H. L. Merrow;* dry gravelly elevated beach, Grace Point, Block Island, *Fernald, Long & Torrey*, no. 10,421; clear dry gravel, top of high bluff, N. W. shore of Block Island, August 11, 1919, *C. B. Graves.* New Jersey: Squam Beach, *J. W. Conrad* in herb. Acad. Nat. Sci. Phila. mag. Rhod. 34: 75. 1932

Apparently hybridizes with *P. oliganthos.* Northward passes imperceptibly into the dwarf (Barm.) Fern. f. pygmaea (Lange) Rouleau, Contr. Monts. 48: 59, 1942.

Var. **glauca** (Hornem.), n. comb. Fig. 4. *P. maritima*, var. *glauca* Hornem. Oec. Pl. ed. 3, i. 167 (1821). *P. borealis* Lange, Fl. Dan. xvi. fasc. xlvi. 5, t. mmdccvii (1867). *P. borealis*, forma *pygmaea* Lange, Medd. om Grønl. iii. 259 (1886).—Greenland to Keewatin and Maine; Iceland and arctic Norway.—The following are typical. Iceland: Seydisfjord, June 16, 1895, *Elizabeth Taylor.* Greenland: Godhaven, August 8, 1914, *Pedersen;* Atâ, August 6, 1921, *A. E. Porsild;* Ikertok Fjord, 1884, *Warming & Holm;* Ipintarssuaq, August 5, 1918, *M. P. & A. E. Porsild;* Itivneq, August 1, 1911, *M. P. & A. E. Porsild.* Labrador: Hopedale, *Sornborger*, no. 108; Makkovik Island, *Townsend*, no. 40; Sandwich Bay, August, 1902, *A. P. Brown;* rocks near sea, Battle Harbor, *C. S. Williamson*, no. 652; stony places, not maritime, Chateau, *J. A. Allen*, no. 80; rocks, Forteau, *Fernald & Wiegand*, nos. 4024, 4025; sea-shore rocks, Blanc Sablon, *Fernald & Wiegand*, no. 4023. Newfoundland: dry

peaty pockets on limestone ledges, Flower Cove, *Fernald, Long & Dunbar*, no. 27,080; dry exposed ledges and shingle on the limestone tableland, Table Mt., Port à Port Bay, *Fernald & St. John*, no. 10,863; Fogo Island, August 7, 1903, *Sornborger;* rocky shore, Channel, *Howe & Lang*, 797, in part. Quebec: Bonne Espérance, *J. A. Allen*, no. 79; Natashquan River, August, 1912, *C. W. Townsend;* on gneissic rocks, 30 feet above high-water level, Tadousac, *Victorin*, no. 11; gravelly beach, St. Alphonse, Ha Ha Bay, Saguenay River, August 5, 1902, *Williams & Fernald;* crevices of ledge, Rivière du Loup, August, 1902, *Williams & Fernald;* calcareous sea-cliffs, Bonaventure Island, *Fernald & Collins*, no. 1178; gravelly beach, Paspébiac, July 27, 1902, *Williams & Fernald*. Nova Scotia: Eastern Harbour, Cheticamp, *C. B. Robinson*, no. 414. New Brunswick: dry headlands, Grande Anse, *Blake*, no. 5529. Maine: top of cliff, Cutler, July 2, 1902, *Kennedy, Williams, Collins & Fernald;* crevices of ledges, Orrs Island, *Chamberlain & Knowlton*, no. 576. Keewatin: Churchill, *J. M. Macoun*, no. 79,369.

Var. **laurentiana** n. var. (fig. 5), foliis lanceolatis vel oblanceolatis acutis vel subacutis 3–15 mm. latis, plerumque depressis vel rosulatis integris vel remote dentatis plerumque scapos arcuatos superantibus.—Newfoundland, Magdalen Islands, Prince Edward Island and Nova Scotia. Newfoundland: Baccallieu Island, June 28, 1902, *Sornborger;* Funk Island, August 1, 1908, *H. S. Forbes;* cliffs, Placentia, *Robinson & Schrenk*, no. 70; calcareous cliffs and ledges, Cow Head, *Fernald & Wiegand*, no. 4022; wet sand, Stephenville Crossing, *Fernald & Wiegand*, no. 4026. Magdalen Islands: dry sandy headland, Brion Island, *St. John*, no. 1986. Prince Edward Island: dry sands, Wood Island, *Fernald & St. John*, no. 11,183. Nova Scotia: Bay St. Lawrence, Cape Breton, August 15, 1904, *J. R. Churchill* (type in Gray Herb.); crevices of red-sandstone cliffs, Sydney, August 18, 1902, *Fernald;* pebbly beach, Yarmouth, *Howe & Lang*, no. 40.

P. oliganthos Roem. & Schultes, Syst. iii. 122 (1818).—Two geographic varieties:

Leaves mostly erect or strongly ascending, in mature plants up to 12 mm. broad, mostly equaling or exceeding the erect scapes but usually overtopped by the mature spikes; the latter 0.3–2 dm. long, often remotely flowered at base. . Var. *typica.*

Leaves mostly loosely spreading or arching, slender, 0.5–4 mm. wide, mostly overtopping the spikes; scapes depressed or arched-ascending; spikes 0.5–7 cm. long, usually dense. . . . . Var. *fallax.*

P. oliganthos, var. **typica.** Fig. 6. *P. oliganthos* Roem. & Schultes, Syst. iii. 122 (1818), as to plant of New England and New Jersey. *P. pauciflora* Pursh, Fl. Am. Sept. i. 99 (1814), as to plant of New England and New Jersey, not Gilib. (1782) nor Lam. (1783). *P. maritima* Am. auth. in part, not L. *P. decipiens* Gray, Syn. Fl. N. A. ii. pt. 1: 390 (1878), not Barnéoud.—Salt-marshes and saline

or brackish shores, south shore of the River St. Lawrence, Quebec to New Jersey; also Manitoba. The following, selected from about 150 sheets, are typical. QUEBEC, Rivière du Loup, August 2, 1902, *Williams & Fernald;* York, August 25, 1904, *Collins, Fernald & Pease.* PRINCE EDWARD ISLAND: Brackley Point, *J. Macoun,* no. 16,877; Charlottetown, *Fernald, Long & St. John,* no. 8046. NOVA SCOTIA: Granville, *Fernald & Fassett,* nos. 24,114, 24,115; Atwood Brook, *Bartram & Long,* no. 24,513; Bridgewater, *Fernald & Long,* no. 24,516. NEW BRUNSWICK: Bathurst, *Blake,* no. 5374; St. Andrew's, July 27, 1900, *Fowler.* MAINE: Machiasport, August 30, 1898, *M. A. Barber;* Great Cranberry Isle, *Rand;* Hampden, *Fernald & Long,* no. 14,553; Westport, August 22, 1907, *I. W. Anderson;* Cumberland, *Chamberlain & Knowlton,* no. 536; Cape Elizabeth, July 23, 1889, *Fernald;* Kennebunkport, *Pease,* no. 1998; Wells, 1898, *Kate Furbish.* NEW HAMPSHIRE: Rye, September 19, 1901, *E. F. Williams.* MASSACHUSETTS: Plum Island, *D. White,* no. 144; Malden, July 19, 1887, *F. S. Collins;* Cambridge, 1857, *Gray;* Revere, *Young et al.;* Cohasset, August 6, 1907, *Driggs;* Pocasset, Bourne, *F. S. Collins,* no. 2637; Centerville, August 27, 1903, *Clara Imogene Cheney;* Osterville, September 6, 1896, *Williams;* Yarmouth, *Fernald & Long,* no. 19,106; Monomoy Point, August 27, 1879, *Brainerd;* Dartmouth, *Collins,* no. 2877; Tisbury, *Seymour,* no. 2015; Gay Head, August 2, 1897, *S. Harris;* Quaise, Nantucket, September 7, 1902, *Floyd.* RHODE ISLAND: Tiverton, *Greenman,* no. 1701; Providence, June, 1844, *Thurber;* Wickford, September 11, 1913, *C. F. Batchelder.* CONNECTICUT: Lyme, August, 1858, *D. C. Eaton;* Saybrook Point, *Blewitt,* no. 602; Milford, *Eames et al.;* Bridgeport, September 7, 1896, *Eames;* Greenwich, August 9, 1901, *Bissell.* NEW YORK: Long Island, *Torrey.* NEW JERSEY: Point Pleasant, August 8, 1908, *E. B. Bartram;* Brigantine, *C. E. Smith;* Atlantic City, *Diffenbaugh et al.;* Absecon, *F. L. Bassett et al.;* Absecon Beach, 1910, *C. H. LaWall;* Egg Harbor, *Nuttall;* Ocean City, *Stone, Fretz;* Palermo, July 26, 1909, *Van Pelt;* Wildwood, *Lippencott et al;* Five-mile Beach, September 25, 1900, *MacElwee.* MANITOBA: salt springs, Red Deer River, *J. Macoun,* no. 16,878.

Both Chas. Pickering and Thos. Nuttall had *P. oliganthos* separated in their herbaria as a new species, under manuscript names.

Var. **fallax**, n. var. (FIG. 7), foliis plerumque diffusis vel laxe arcuatis anguste linearibus 0.5–4 mm. latis spicis longioribus; scapis arcuatis; spicis 0.5–7 cm. longis plerumque densifloris.—Labrador and Newfoundland to eastern Maine.—LABRADOR: Mulligan Point, Lake Melville, July 25, 1891, *Bowdoin College Exped.,* no. 126 (TYPE in Gray Herb.); Middle Bay, July 29, 1882, *J. A. Allen,* no. 10. NEWFOUNDLAND: sea-shore, Flower Cove, July 12, 1921, *M. E. Priest;* muddy saline shores, near Frenchman's Cove, Bay of Islands, July 7, 1921, *Mackenzie & Griscom,* no. 10,436; sea-beach, Little

River, August 1, 1922, *Mackenzie & Griscom*, no 11,180; salt-marsh and brackish mud, Norris Arm, August 21, 1911, *Fernald & Wiegand*, no. 6218; salt-marsh, Killigrew's, August 3, 1911, *Fernald & Wiegand*, no. 6216. Quebec: shore of Esquimaux River, lat. 51°, 29′, July 27, 1882, *Allen*, no. 81; rocky beach, Ile des Genévriers, Archipel de St. Augustin, July 21, 1915, *St. John*, no. 90,731; gravelly beach, Carleton, July 21, 1904, *Collins & Fernald*. New Brunswick: salt-marsh, Bathurst, July 24, 1902, *Williams & Fernald* (transition to var. *typica*). Maine: wet rocks, Cutler, July 2, 1902, *Kennedy, Williams, Collins & Fernald* (transition to var. *typica*); Great Cranberry Island, July 17, 1897, *Williams*.

As already pointed out the name *P. oliganthos* is inappropriate for the long-spiked plant of New England and New Jersey, and particularly so in view of the northern var. *fallax* which actually has comparatively few flowers. The Labrador plant mentioned by Pursh as supplementing and belonging with the plant of New England and New Jersey, was presumably var. *fallax*, but the name *P. oliganthos* must be retained for the plant with linear-lanceolate leaves of New England and New Jersey, since that is what Pursh obviously intended. The name would better fit var. *fallax* but the Labrador element can hardly be taken as the *type* of Pursh's *P. pauciflora*.

Gray Herbarium.

Explanation of Plate 150

Fig. 1, *Plantago juncoides* × ¾, from Skagway, Alaska, *Eastwood*, no. 729. Fig. 2, *P. juncoides*, var. *californica* × ¾, from Montara Point, California, *Copeland*, no. 3331 (type). Fig. 3, *P. juncoides*, var. *decipiens* × ¾, from Cap à l'Aigle, Quebec, *Macoun*, no. 68,671; 3*a*, fruit × 10; 3*b*, seeds × 10. Fig. 4, *P. juncoides*, var. *glauca* × ¾, from Atâ, Greenland, *Porsild*. Fig. 5, *P. juncoides*, var. *laurentiana* × ¾, from Bay St. Lawrence, Cape Breton, Nova Scotia, *Churchill* (type). Fig. 6, *P. oliganthos* × ¾, from Greenwich, Connecticut, *Bissell;* 6*a*, fruit × 10; 6*b*, seeds × 10. Fig. 7, *P. oliganthos*, var. *fallax* × ¾, from Mulligan's Point, Lake Melville, Labrador, *Bowdoin College Exped.*, no. 126 (type).

NOMENCLATORIAL CHANGES FOR SOME CHINESE ORCHIDS.

H. H. Hu.

While working on my "Synopsis of Chinese Genera of Phaenogams with Descriptions of Representative Species," I have come across a number of Chinese orchids, the names of which should be changed according to the latest researches. In my book I am not following the International Rules of Botanical Nomenclature in retaining the Nomina Conservanda, but am using the oldest generic names since the publication of Linnaeus's Species Plantarum in 1753. However, in the present paper only those combinations are included which are in accordance with the International Rules.

Cordula esquirolei (Schlechter) Hu, comb. nov.

Paphiopedilum esquirolei Schlechter, Orchideol. Sino-Jap. Prod. 39 (1919).

R. A. Rolfe in a footnote in the Orchid Review XX. 2 (1912) pointed out that the generic name *Paphiopedilum* Pfitzer should be replaced by Rafinesque's *Cordula* which was published in his Flora Telluriana (1836). There are 3 species of *Paphiopedilum* recorded in China. Rolfe made the combinations needful for 2 of them, namely *C. purpurata* and *C. parishii*. Following him I propose the above combination for the third species.

Amesia discolor (Kränzlin) Hu, comb. nov.

Epipactis discolor Kränzlin in Fedde, Rept. xvii. 100 (1921).

Since A. A. Eaton pointed out in the Proceedings of the Biological Society of Washington, xxi. 63 (1908) that *Epipactis* (Haller) Boehmer was published earlier than *Epipactis* Adanson and should be used to replace *Goodyera* R. Brown, A. Nelson and J. F. Macbride in the Bot. Gaz. lvi. 472 (1913) proposed the name *Amesia* to replace *Epipactis* Adanson. In following these authors, I propose both the above and the following new combinations for the Chinese species of these two genera.

Amesia mairei (Schlechter) Hu, comb. nov.

Epipactis mairei Schlechter, Orchideol. Sino-Jap. Prod. 55 (1919).

Amesia monticola (Schlechter) Hu, comb. nov.

Epipactis monticola Schlechter in Meddel. fr. Göteb. Bot. Träg. I. 144 (1924).

Amesia royleana (Lindley) Hu, comb. nov.
Epipactis royleana Lindley in Royle, Illustr. 368 (1839).
Cephalanthera royleana Regel in Act. Hort. Petrop. vi. 490 (1879).
Limodorum royleanum O. Kuntze, Rev. Gen. i. 671 (1891).

Amesia schensiana (Schlechter) Hu, comb. nov.
Epipactis schensiana Schlechter in Pax, Aufz. von Dr. Limpricht Pflanz. 347 (1923).

Amesia setschuanica (Ames & Schlechter) Hu, comb. nov.
Epipactis setschuanica Ames & Schlechter in Schlechter, Orchideol. Sino-Jap. Prod. 56. (1919).

Amesia squamellosa (Schlechter) Hu, comb. nov.
Epipactis squamellosa Schlechter, Orchideol. Sino-Jap. Prod. 56 (1919).

Amesia tangutica (Schlechter) Hu, comb. nov.
Epipactis tangutica Schlechter, Orchideol. Sino-Jap. Prod. 57 (1919).

Amesia tenii (Schlechter) Hu, comb. nov.
Epipactis tenii Schlechter in Fedde, Rept. xvii. 64 (1920).

Amesia wilsoni (Schlechter) Hu, comb. nov.
Epipactis wilsoni Schlechter in Fedde, Rept. xx. 382 (1924).

Amesia xanthophaea (Schlechter) Hu, comb. nov.
Epipactis xanthophaea Schlechter in Pax, Aufz. von Dr. Limpricht Pflan. 341 (1923).

Amesia yunnanensis (Schlechter) Hu, comb. nov.
Epipactis yunnanensis Schlechter, Orchideol. Sino-Jap. Prod. 57 (1919).

Epipactis chinensis (Schlechter) Hu, comb. nov.
Goodyera chinensis Schlechter, Orchideol. Sino-Jap. Prod. 59. (1919)

Epipactis labiata (Pampanini) Hu, comb. nov.
Goodyera labiata Pampanini in Nuov. Giorn. Bot. It. n. s. xvii. 246 (1910).

Epipactis mairei (Schlechter) Hu, comb. nov.
Goodyera mairei Schlechter in Fedde, Rept. xvii. 65 (1920).

Epipactis melinostele (Schlechter) Hu, comb. nov.
Goodyera melinostele Schlechter, Orchideol. Sino-Jap. Prod. 59 (1919).

Epipactis pauciflora (Schlechter) Hu, comb. nov.
Goodyera pauciflora Schlechter in Fedde, Rept. xii. 106 (1913).

Epipactis secundiflora (Lindley) Hu, comb. nov.
Goodyera secundiflora Lindley in Journ. Linn. Soc. i. 182 (1857).

Orchiodes secundiflora O. Kuntze, Rev. Gen. i. 675 (1891).

Epipactis yunnanensis (Schlechter) Hu, comb. nov.

Goodyera yunnanensis Schlechter, Orchideol. Sino-Jap. 60 (1919).

Pholidota yunpeensis Hu, nom. nov.

Pholidota yunnanensis Schlechter in Fedde, Rept. xx. 378 (1924), non Rolfe.

In naming this species Dr. Schlechter overlooked Rolfe's species published in Journ. Linn. Soc. xxxvi. 24 (1903). Since the latter is a valid species, this new homonym cannot be maintained, hence the proposed change.

Neofinetia Hu, nom. nov.

Finetia Schlechter in Beih. Bot. Centrbl. xxxvi. Abt. ii. 140 (1917), non Gagnepain.

There is a *Finetia* of the *Combretaceae* published by Gagnepain in Notulae Systematicae of the Herbier du Muséum de Paris iii. 278 (1916). This homonym should not be maintained, and a new name for this genus and a new combination for the following species are proposed.

Neofinetia falcata (Thunberg) Hu, comb. nov.

Orchis falcata Thunberg, Flor. Jap. 26 (1784).

Limodorum falcatum Thunberg in Trans. Linn. Soc. ii. 326 (1794).

Oeceoclades falcata Lindley, Gen. & Spec. Orch. 237 (1833).

Angraecum falcatum Lindley, Gen. & Spec. Orch. 237 (1833).

Vanda falcata Beer, Prakt. Stud. Orch. 317 (1854).

Oeceoclades lindleyana Regel, Ind. Sem. Hort. Petrop. 43 (1865).

Oeceoclades lindleyi Regel, Gartenfl. 70 (1866).

Angorchis falcata O. Kuntze, Rev. Gen. i. 651 (1891).

Angraecopsis falcata Schlechter, Orchid. 601 (1914).

Finetia falcata Schlechter in Beih. Bot. Centrbl. xxxvi. Abt. ii. 140 (1918).

CYPRIPEDIUM REGINAE IN NEW HAMPSHIRE.

Charles Schweinfurth

During September 1924, the writer saw a clump of the Showy Lady's Slipper, *Cypripedium reginae* Walt. (*C. hirsutum* of recent American authors, probably not Mill.) in the foot-hills of the White Mountains of New Hampshire. The exact location was a little

swamp in Campton, Grafton County, in about the middle of the state.

No New Hampshire records of this orchid appear in the Gray Herbarium, the Herbaria of Oakes Ames or of the New England Botanical Club, the three largest collections about Boston. But a reference to literature throws some light on the situation. Baldwin, in his "Orchids of New England" cites seven New Hampshire stations viz. Hanover, Lebanon, Franconia, Amherst, Crawford House, South Conway and West Concord. The two former localities are recorded by Jesup and are doubtless still extant, but a station at Concord (perhaps the West Concord locality of Baldwin) is cited as extinct by F. W. Batchelder. Moreover it is absent from Coös County.

What particularly interested the writer was that this orchid, usually a typical calciphile, should occur in a granite country. For certainly the plant association was anything but calcicole. Nearest the orchid grew *Vaccinium canadense, Carex crinita* var. *gynandra, Galium Claytonii, Coptis trifolia, Osmunda Claytoniana, Oakesia sessilifolia, Fragaria virginiana, Salix discolor, Gaultheria procumbens* and *Lycopus uniflorus*. Other parts of the swamp showed *Picea mariana, Epilobium densum, Trifolium agrarium, Salix sericea, Rhododendron canadense, Chiogenes hispidula, Osmunda cinnamomea, Acer rubrum*, the common Spiraeas and several common Solidagos. Several of these plants such as the Vaccinium, Gaultheria, *Picea mariana* and Rhodora typify the calcifuge group.

C. H. Hitchcock's Geology of New Hampshire shows, however, that a considerable strip of limestone occurs in the Connecticut River Valley some distance to the southwest of Campton. In addition he says that the glacial till from the northwest contains fragments of limestone which are scattered over the gneissic area to the southeast. Also the Franconia mountains, consisting chiefly of syenite, furnish calcium from their lime feldspars and lime micas. So the region appears to have some flavor of calcium. But the station here first recorded seems distinctly worth citing, for the Showy Lady's Slipper is rare and local in this New England State.

Three of the orchid stalks are close together and doubtless rise from a common corm. The fourth, distant several inches, is perhaps a separate plant. Altogether they present a fairly stocky growth, though apparently not so stout as late season plants from Berkshire

County, Massachusetts, or northern Vermont. Perhaps this is caused by an attempt, several years ago, to dig up the plants. When seen by the writer, one stalk had produced a single flower; two, a pair of blossoms; and one, three blooms. Three good capsules were ripening.

This orchid was discovered at the Hebron locality some twenty years ago (circa 1902) by Mrs. Andrew Morgan, through whose courtesy the station on her estate was revealed. Other parts of the same swamp failed to show any other Showy Lady's Slippers.

Wellesley Farms, Massachusetts.

THE AMPHIBIOUS GROUP OF POLYGONUM, SUBGENUS PERSICARIA.

E. E. Stanford.

I. Adaptation in Polygonum amphibium

The ecological adaptations in the old-world *Polygonum amphibium* L. have been known longer and studied in greater detail than those of the species of corresponding habit in America. The following brief review of the principal literature indicates the scope and results of the chief observations and researches centering round the adaptations of this plant.

P. amphibium is indeed a classic example of adaptability to diverse conditions. The aquatic form is conspicuous in the European water-flora, and is probably the Potamogeton of the ancients. Among pre-Linnean writers the description of Ray[1] has been usually cited as the oldest extant recorded observation of the terrestrial and aquatic forms. Both were described by Linnaeus,[2] though not directly referred to in the Species Plantarum (1753). More recent European writers have described a number of forms, which may apparently be reduced for the present purpose to three, referable to *P. amphibium* var. *natans* Moench, Enum. Pl. Hassk. 28 (1777); var. *terrestre* Leers, Fl. Herborn. 99 (1775); and var. *maritimum* Detharding, Consp. Pl. Magn. Megal. Phan. 33 (1828). The first is the typical floating form, with coriaceous floating or emersed leaves devoid of hair except for the margin, flowering abundantly; the second an upright land-adaptation, with short-petioled rough-hairy leaves, flowering rarely

[1] Ray, Historia Plantarum, i. 184 (1686).
[2] L. Fl. Suec. 115 (1745).

but perennating rapidly by rhizomatiform more or less creeping stems; and the third a reduced and extremely hairy form of sand dunes and similar arid habitat, flowering still more rarely, according to Massart[1] never.

These peculiarities of *P. amphibium* have inspired a number of later European investigations and notes. Irmisch[2] observed and described seed-germination and the development of the seedling, noted the quack-like spreading habit of the plant, and commented upon the rarity of its fruiting. He described its heterostyly and noted that in the long-styled form the anthers produced little or no well-developed pollen and usually shriveled without opening. He found no blooming plant on really dry ground.[3] He saw emersed plants with lower floating leaves of the type of var. *natans* and the upper foliage of var. *terrestre*. Hildebrand[4] submerged the terrestrial form, whereupon the leaves died and the rhizome put out other branches which formed floating leaves. Hildebrand also described the distribution of stomata, in air-leaves few above and many below; in floating leaves all on the upper surface. Hoffmann[5] repeated the experiment of Hildebrand, with similar results, but was unable again to produce the aquatic form from his plants with the induced terrestrial habit, even after they had been for two years transferred to two feet of water. Hoffmann also produced var. *maritimum* from var. *natans* by planting the latter in sand to which he added sodium chloride. An attempt to produce *P. aviculare* var. *littorale* from typical *P. aviculare* by similar means failed.

Schmidt[6] and Schenck[7] recorded observations on the assumption of the terrestrial form by formerly floating plants under the influence of drought. Constantin[8] made extensive anatomical studies of stem-

[1] Massart, *L'Accommotation individuelle chez Polygonum amphibium*. Bull. Jard. Bot. Brux. i. 72–88 (1902).

[2] Irmisch, *Ueber Polygonum amphibium*, etc. Bot. Zeit. xix. 105–109 (1861).

[3] Notes on the sterility of the land-forms constantly recur in the European literature, and similar observations are made concerning the terrestrial forms of the North America *P. natans*. Reduction of reproductive capacity following change of environment has perhaps attracted more attention among animals than plants, but the phenomenon exemplified by *P. natans* and *P. amphibium* is by no means an isolated one in the vegetable kingdom.

[4] Hildebrand, *Ueber die Schwimmblatter von Marsilia und einigen anderen amphibischen Pflanzen*. Bot. Zeit. xxviii. 17–23 (1870).

[5] Hoffmann, *Untersuchungen über Variation*. Ber. der Oberhessisch. Gesellsch. f. Natur u. Heilkunde. xvi. 1–37 (1877).

[6] Schmidt as quoted by Schenck, Massart and others.

[7] Schenck, *Die Biologie der Wassergewachse*. Verhandl. Naturhist. Vereines d. preuss. Rheinl. xlii. 217–280 (1885).

[8] Constantin, Ann. Sci. Nat. sér. 6, Bot. xix. 287–331 (1884); Bull. Soc. Bot. Fr. xxxii. 83–88 (1885); Ann. Sci. Nat. sér. 7, Bot. iii. 94–162 (1886).

structure, epidermal characters, and the leaf-structure of terrestrial and aquatic forms. He successfully repeated Hildebrand's experiment, using different portions of the same plant, which he planted in terrestrial and aquatic environments. Volkens[1] also investigated and figured the anatomical differences in the stem and leaf of aerial and water forms. His figures include an enlargement of the peculiar short stiff bristle-like hair that forms a striking characteristic of the European *P. amphibium* when contrasted with the longer and weaker ones of its American counterpart.

Massart[2] interested himself particularly in the xerophile form (*P. amphibium* var. *maritimum*). He carried on cultural experiments to prove that the three varieties were merely adaptive states which could be made to pass at will from one to the other. He figured cross-sections of the leaves and stems of aquatic and xerophile types, the epidermal, characters, and various types of hairs from the three forms.

As to the systematic rank of these well-known ecological forms, most European treatments term them varieties rather than formae. Moss[3] reduced the var. *terrestre* to formal rank, and inasmuch as this disposition seems best to accord with the systematic plan adopted in the International Code, in the taxonomic portion of the present study both the water- and land-adaptations of *P. amphibium* are treated as formae.

In addition to its adaptability to various habitats, it appears that the European plant—in common with a considerable number of other plants of that continent—is a rather more aggressive weed than its American relatives. Leers,[4] who found the terrestrial form growing "in cultis *in der Pitze & vor dem Homberg*" termed it vigorously "pessimum vitium." At a much later date Compton[5] reported a rather striking instance of the pioneering ability of the aquatic form. Twenty-four square miles of East Anglian fenland was flooded from January to October, 1915 so as

"to extinguish the centuries-old terrestrial flora . . . and to replace it by an aquatic flora derived from the waters of the drainage-channels . . . .

[1] Volkens, *Zur Kenntniss der Beziehungen zwischen Standort und anatomischen Bau der Vegetationsorgane.* Jahrb. König. Bot. Gart. Berl. iii. 1–46 (1884).

[2] Massart, l. c. (1902).

[3] Moss, Camb. Brit. Fl. ii. 115 (1914).

[4] Leers, Fl. Herborn. 99 (1775).

[5] Compton, *The Botanical Results of a Fenland Flood.* Journ. Ecol. iv. 15–17 (1916).

"*Cladophora flavescens* covered a very large proportion of the flooded area, acres at a stretch, either pure or mixed with *Polygonum amphibium*. The latter occurred in considerable abundance, rooting in the peaty soil, and producing branches often eight feet long (an indication of the depth of the flood) which bore fruit and seeded freely. In many cases these plants were so frequent that their leaves must have formed a thick coating to the water."

In this flooded area *P. amphibium* and *Alisma Plantago-aquatica* were the most abundant seed-plants.

(To be continued.)

The date of the May issue (unpublished as this goes to press) will be announced later.

A. E. Brackett del.

MARITIME PLANTAINS OF NORTH AMERICA.